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ABSTRACT

Data were obtained in 1982 from 196 vocational agriculture teachers and 48 county agricultural extension agents identifying specific problems in West Virginia's agriculture that were most in need of research solutions. Multiflora rose eradication, coping with high production costs and interest rates, and improving state level funding for extension and vocational agriculture programs were the most serious agricultural problems in need of research solutions. A need also exists for a clear, dynamic process for evaluating current research activities, identifying potential research opportunities, and developing mission-oriented research priorities. Publicly supported agricultural research should be expanded and steps taken to ensure that research policy and programs adequately reflect needs and concerns of West Virginia's entire agricultural community. The Cooperative Extension Service is charged with disseminating research findings to the agricultural community, yet vocational agriculture teachers and county extension agents are somewhat unaware of available research information. The need for research findings to be quickly communicated to educators and farmers necessitates close links and mutual understanding between research and extension education and timely publication of research results. The current research program at West Virginia University and other affiliated institutions may need improvement or adjustments. Problems unique to various regions should be given due consideration. (BRR)

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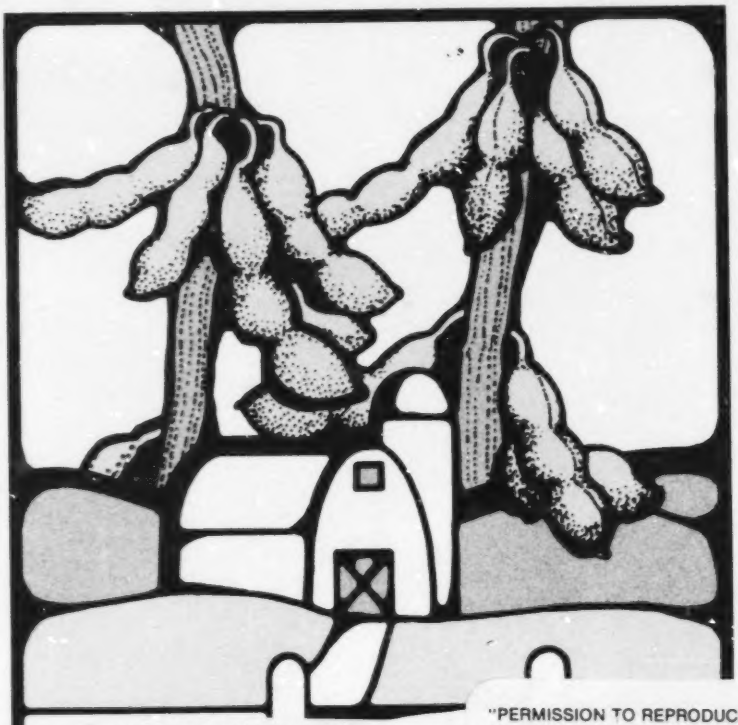

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# AGRICULTURAL RESEARCH NEEDS AND PRIORITIES AS PERCEIVED BY WEST VIRGINIA VOCATIONAL AGRICULTURE TEACHERS AND COUNTY EXTENSION AGENTS

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## Contents


Objectives of the Study ..... 4
Research Methods and Procedures ..... 4
Analysis of Data ..... 7
Very Important Problems in Agriculture
in Need of Research Solutions ..... 7
Specific Problems in Need of Research Solutions:

Field Crop Production ..... 18
Horticulture ..... 21
Plant Pest/Disease Management ..... 21
Pasture Management ..... 26
Livestock Production ..... 26
Agricultural Marketing ..... 30
Farm Management ..... 33
Farm Machinery and Structures ..... 33
Soil and Water Conservation ..... 37
Agricultural Energy ..... 37
Rural Development, Extension and Education ..... 40

Conclusions ..... 44
Recommendations ..... 45
Bibliography ..... 47



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# Agricultural Research Needs and Priorities As Perceived by West Virginia Vocational Agriculture Teachers and County Extension Agents

**Lucas R. Chalamira and Layle D. Lawrence**

Productivity of the American farmer allows this to be not only the best fed nation in the world at a low cost for the consumer, but one of the leading nations in the export of food and fiber. Agricultural products rank first in value among the U.S. exports. In addition, labor efficiency in agriculture has freed vast numbers of people for other activities permitting the United States to become a giant industrial nation. One of the entities responsible for this miracle of agricultural productivity is the research system operated by land-grant universities[1] which has provided a steady stream of new knowledge and technologies needed to overcome problems and to enhance efficiency.

Federal support in university agricultural research began with passage of the Hatch Act of 1887 which created the state agricultural experiment station (USDA, 1962:219). The Hatch Act provided:

> . . . that in order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experimentation respecting the principles and application of agricultural science, there shall be established, under the direction of the college or colleges or agricultural department of colleges in each state . . . a department to be known as an agriculture experiment station.

This public policy in support of research has been termed the single most effective policy element responsible for technical and economic development in agriculture during this century. Public investment in this research has been substantial, but the returns have far exceeded the costs (Committee of Science and Technology, 1975:139).

The agricultural industry is passing through a period of extremely rapid change—the most rapid and significant in its history. As a result, the most pressing problem facing the industry is that of making prompt and appropriate adjustments. The magnitude of these changes, the diversity of problems facing agriculture, the amount of financial and human resources currently being invested in agricultural research, and the type of research being undertaken has created public concern. A review of current literature (see Bibliography) indicates that farmers, vocational agriculture teachers, county extension

[1]Agricultural institutions established by the Morrill Act of 1862.

agents, policymakers, and even scientists complain that present research programs do not meet the needs of the continually changing agricultural industry. They charge that too few research programs are aimed at solving the immediate and pressing problems of the farmers and society; that too much of the research is being undertaken for academic purposes; and that too much emphasis is being placed on basic research which, although potentially useful in the long run, is presently of little benefit. Thus, the belief persists that the present agricultural research programs carried out by publicly supported research institutions are not as effective in meeting the needs and interests of the American agricultural community as they might be. This study was conducted to identify those specific agricultural problems in West Virginia most in need of research solutions, as perceived by vocational agriculture teachers and county agricultural extension agents. An awareness of research needs felt at the grass-roots level should enable agricultural scientists and administrators to more thoroughly evaluate present research programs and plan appropriate future undertakings.

## Objectives of the Study

1. Identify specific agricultural problems most in need of research solutions in West Virginia as perceived by vocational agriculture teachers and county agricultural extension agents.
2. Rank the problems identified according to their perceived importance, and thus provide information for evaluating and/or developing research programs.

## Research Methods and Procedures

In March, 1982, a modified delphi technique was used to obtain data from 196 vocational agriculture teachers and 48 county agricultural extension agents of West Virginia. These professional agriculturalists, through their strategic positions and close contacts with farmers and the agricultural business community, are in appropriate positions to perceive problems pertaining to agriculture which may require solutions through research.

Two types of questionnaires were designed and used for collection of data. In the first the participant was asked to respond to: "In your opinion, what are the five specific problems in agriculture most in need of research solutions in your community?"

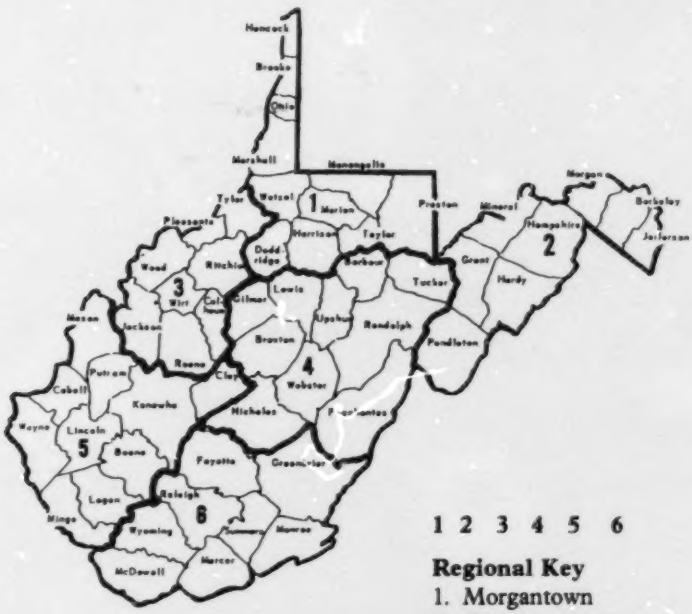
After receiving the responses, a Q-sort committee[2] scrutinized, edited, and combined the opinions into 136 ratable statements or problems. These statements formed the second questionnaire, which was mailed to the same population. Participants were asked to rate the importance of each problem to their own community on the following scale:

[2]Panel of two or three people appointed to scrutinize and refine information elicited from participants.

1 = not important
2 = somewhat important
3 = important
4 = very important

Of the 154 participants, 116 (75 percent) responded to the survey and provided data upon which the study is based.

Overall mean ratings were derived for each statement. Means were also determined according to the participants' position and region and by category variables. Analysis of data by regions was based on existing administrative areas of the West Virginia Cooperative Extension Service as indicated in Figure 1. Extension regions (or areas) and counties included are shown in Table 1.




**Regional Key**

1. Morgantown
2. Keyser
3. Parkersburg
4. Weston
5. Charleston
6. Beckley

Figure 1. West Virginia extension regions (areas) and counties.



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**Table 1.**
Extension regions (areas) and counties included in the study

| 1<br>Morgantown | 2<br>Keyser Area | 3<br>Parkersburg | 4<br>Weston | 5<br>Charleston | 6<br>Beckley |
|---|---|---|---|---|---|
| Hancock | Grant | Tyler | Tucker | Mason | Fayette |
| Brooke | Mineral | Pleasant | Barbour | Putnam | Raleigh |
| Ohio | Hampshire | Ritchie | Randolph | Kanawha | Wyoming |
| Marshall | Hardy | Wood | Upshur | Cabell | Summers |
| Wetzel | Pendleton | Calhoun | Lewis | Lincoln | Greenbrier |
| Monongalia | Morgan | Roane | Gilmer | Boone | Monroe |
| Preston | Berkeley | Jackson | Braxton | Logan | Mercer |
| Marion | Jefferson | Wirt | Webster | Mingo | McDowell |
| Taylor | | | Nicholas | Wayne | |
| Harrison | | | Pocahontas | | |
| Doddridge | | | | | |

Source: Cooperative Extension Service, WVU.

## Analysis of Data

For purpose of analysis and interpretation, consensus was based on mean values as follows: *not important* 1.25 or below; *somewhat important* between 1.25 and 2.24; *important* between 2.25 and 3.24; and *very important* 3.25 and above.

## Very Important Problems in Agriculture In Need of Research Solutions

Table 2 presents nineteen statements which were perceived to be very important (mean ratings of 3.25 or above) by vocational agriculture teachers and county extension agents. The three most important were: Multiflora rose eradication (3.63); Coping with high production costs and interest rates (3.55); and Improving state level funding for extension and vo-ag programs (3.52).

Statements rated by participants were categorized into eleven problem areas. Of the 19 statements which received overall mean ratings of 3.25 and above, five were related to rural development and extension/education, four were in pasture management, three in field crop production, two in livestock production, three in farm management, and two in plant pest/disease management.

Data for the study were secured from vocational agriculture teachers and county agricultural extension agents in West Virginia. These professional agriculturalists, through their strategic positions and experience in rural communities were thought to be in appropriate positions to perceive problems pertaining to agriculture. However, because of differences in their day-to-day activities and responsibilities, their perceptions of the problems identified may also differ.

Table 3 contains a list of problems in agriculture, with mean ratings of 3.25 and above, as perceived by each of the two groups. Although ten problems were rated as "very important" by both groups, data indicate that there was an element of disagreement regarding the importance of several problem areas both by degree of rating and by type of problems identified. Vocational agriculture teachers rated the following as the top four problems: Coping with high production costs and interest rates (mean of 3.61); Multiflora rose eradication (3.58); Protection of farm land from oil, gas and coal companies (mean of 3.56); and Improvement of state level funding for extension and vo-ag programs (mean of 3.25).

On the other hand, county extension agents rated the following as the top four problems: Multiflora rose eradication (3.73), Chemical weed and brush control (3.50); Improvement of state level funding for extension and vo-ag programs (3.51); and Control of face fly (3.47).

In general, vocational agriculture teachers perceived more problems to be of a serious nature (19) than did county extension agents (14).

**Table 2.**
Specific problems in agriculture most in need of research solutions, ranked with mean ratings of 3.25 and above

| Problem and Overall Rank | Overall Mean (N=116) | S.D. |
|---|---|---|
| 1. Multiflora rose eradication | 3.63 | 0.70 |
| 2. Coping with high production costs and interest rates | 3.55 | 0.69 |
| 3. Improving state level funding for extension and vo-ag programs | 3.52 | 0.74 |
| 4. Protection of farmland from oil, gas and coal companies | 3.48 | 0.72 |
| 5. Chemical weed and brush control in pastures | 3.40 | 0.76 |
| 6. Increasing weaning weights of feeder calves through breeding and nutrition | 3.39 | 0.79 |
| 7. Control of pink eye | 3.38 | 0.76 |
| 8. Budgeting for machinery, buildings, equipment and livestock | 3.37 | 0.72 |
| 9. Economic sources of N, P, and K | 3.35 | 0.70 |
| 10. Liming and fertilization methods for pasture | 3.35 | 0.65 |
| 11. Farmland preservation and retention | 3.34 | 0.75 |
| 12. Control of face fly | 3.31 | 0.76 |
| 13. Haymaking with limited labor | 3.30 | 0.79 |
| 14. Farm estate planning | 3.30 | 0.71 |
| 15. Efficient methods of lime and fertilizer application for small farmers | 3.28 | 0.76 |
| 16. Effects of laws and regulations on the farm community | 3.26 | 0.72 |
| 17. Land owner rights in strip mines and oil field reclamation | 3.26 | 0.96 |
| 18. Pasture renovation methods | 3.25 | 0.69 |
| 19. Development of better quality pasture grasses | 3.25 | 0.71 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

**Table 3.**

Specific problems in agriculture with mean ratings of 3.25 and above as perceived by vocational agriculture teachers and county extension agents

| (Vo-Ag Teachers (VATS)) | | (County Extension Agents (CEA)) | |
|---|---|---|---|
| Problem and Rank | Mean (n=79) | Problem and Rank | Mean (n=37) |
| 1. Coping with high production costs and interest rates | 3.61 | 1. Multiflora rose eradication | 3.73 |
| 2. Multiflora rose eradication | 3.58 | 2. Chemical weed and brush control in pastures | 3.59 |
| 3. Protection of farm land from oil, gas and coal fields | 3.56 | 3. Improvement of state level funding for extension and vo-ag programs | 3.51 |
| 4. Improvement of state level funding for extension and vo-ag programs | 3.52 | 4. Control of face fly | 3.47 |
| 5. Budgeting for machinery, buildings, equipment and livestock | 3.46 | 5. Coping with high production costs and interest rates | 3.45 |
| 6. Increasing weaning weights of feeder calves through breeding and nutrition | 3.43 | 6. Economic sources of N, P, and K | 3.41 |
| 7. Job satisfaction of vo-ag teachers | 3.43 | 7. Farmland preservation and retention | 3.38 |
| 8. Control of pink eye | 3.39 | 8. Development of grasses for acid soil | 3.36 |
| 9. Hay making with limited labor | 3.37 | 9. Liming and fertilization methods for pastures | 3.33 |
| 10. Farm estate planning | 3.37 | 10. Protection of farmland from oil, gas and coal companies | 3.32 |
| 11. Liming and fertilization methods for pasture | 3.35 | 11. Efficient methods of lime and fertilizer application for small farmers | 3.32 |

**(continued)**

**Table 3. (continued)**

| (Vo-Ag Teachers (VATS)) Problem and Rank | Mean (n=79) | (County Extension Agents (CEA)) Problem and Rank | Mean (n=37) |
|---|---|---|---|
| 12. Economic sources of N, P, and K | 3.33 | 12. Increasing weaning weights of feeder calves through breeding and nutrition | 3.30 |
| 13. Farmland preservation and retention | 3.33 | 13. Pasture renovation methods | 3.28 |
| 14. Chemical weed and brush control in pastures | 3.30 | 14. Development of better quality pasture grasses | 3.28 |
| 15. Land owner rights in strip mine and oil field reclamation | 3.30 | | |
| 16. Means of getting started in farming | 3.29 | | |
| 17. Agricultural safety | 3.29 | | |
| 18. Development of better quality pasture grasses | 3.28 | | |
| 19. Efficient methods of lime and fertilizer application | 3.25 | | |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

Table 4 presents data that summarize the perceptions of respondents by regions. Data show that:

—some problems are common in all regions
—perceived importance varies from region to region
—more problems were perceived in some regions than in others.

Problems perceived to be serious in at least five of the six regions include:

—Multiflora rose eradication
—Coping with high production costs and interest rates
—Improving state level funding for extension and vo-ag programs
—Increasing weaning weights of feeder calves through breeding and nutrition
—Farmland retention and preservation

Disparity in perceived importance of the problems was also noted. The three most important problems by rank in each region were as follows:

Region 1 (Morgantown):

1. Chemical weed and brush control in pasture
2. Protection of farmland from oil, gas and coal companies
3. Economic lime usage

Region 2 (Keyser):

1. Coping with high production costs and interest rates
2. Farm estate planning
3. Multiflora rose eradication

Region 3 (Parkersburg):

1. Protection of farmland from oil, gas and coal companies
2. Multiflora rose eradication
3. Coping with high production costs and interest rates

Region 4 (Weston):

1. Need for improved livestock market systems
2. Control of foot rot (sheep)
3. Control of face fly

Region 5 (Charleston):

1. Tobacco production and marketing
2. Multiflora rose eradication
3. Prevention and control of tobacco diseases

Region 6 (Beckley):

1. Multiflora rose eradication
2. Improving state level funding for extension and vo-ag programs
3. Economic sources of N, P and K

**Table 4.**

Specific problems in agriculture, with mean ratings of 3.25 and above most in need of research solutions as perceived by vocational agriculture teachers and county extension agents by region

| Region 1 Morgantown | | Region 2 Keyser Area | |
|---|---|---|---|
| Problem and Rank | Mean (n=23) | Problem and Rank | Mean (n=22) |
| 1. Chemical weed and brush control in pasture | 3.56 | 1. Coping with high production cost and interest rates | 3.73 |
| 2. Protection of farm land from oil, gas and coal companies | 3.56 | 2. Farm estate planning | 3.68 |
| 3. Economic lime usage | 3.52 | 3. Multiflora rose eradication | 3.64 |
| 4. Liming and fertilization methods for pasture | 3.48 | 4. Farmland preservation and retention | 3.64 |
| 5. Multiflora rose eradication | 3.43 | 5. Improvement of state level funding for extension and vo-ag programs | 3.64 |
| 6. Pasture renovation methods | 3.43 | 6. Increasing weaning weights of feeder calves through breeding and nutrition | 3.59 |
| 7. Application of lime on steep land | 3.43 | 7. Budgeting for machinery, buildings, equipment and livestock | 3.59 |
| 8. Landowner rights in strip mine and oil field reclamation | 3.43 | 8. Control of Johnson grass | 3.55 |
| 9. Economic sources of N, P, and K | 3.39 | 9. Chemical weed control of crops | 3.55 |
| 10. Development of better quality pasture legumes | 3.39 | 10. Forages for shale lands in eastern West Virginia | 3.50 |
| 11. Development of quality pasture grasses | 3.39 | 11. Control of pink eye | 3.50 |
| 12. Prevention of grass tetany | 3.39 | 12. Control of gypsy moth | 3.45 |
| 13. Coping with high production costs and interest rates | 3.39 | | |

| | | |
|---|---|---|
| 14. | Practical and inexpensive soil erosion control measures | 3.39 |
| 15. | Improvement of state level funding for extension and vo-ag programs | 3.39 |
| 16. | Hay making with limited labor | 3.35 |
| 17. | Increasing weaning weights of feeder calves through breeding and nutrition | 3.30 |
| 18. | Control of pink eye | 3.30 |
| 19. | Control of foot rot (sheep) | 3.30 |
| 20. | Need for improved livestock marketing systems | 3.26 |
| 21. | Means of getting started in farming | 3.26 |
| 22. | Farmland preservation and retention | 3.26 |
| 23. | Budgeting for machinery, buildings, equipment and livestock | 3.26 |
| 24. | Development of grasses for acid soil | 3.26 |



(continued)

| | | |
|---|---|---|
| 13. | No-till corn production practices | 3.41 |
| 14. | Efficient methods of lime and fertilizer application for small farms | 3.41 |
| 15. | Effective deer control methods | 3.41 |
| 16. | Extended grazing season methods | 3.41 |
| 17. | Haymaking with limited labor | 3.41 |
| 18. | Effect of laws and regulations on the farm community | 3.41 |
| 19. | Chemical weed and brush control in pastures | 3.36 |
| 20. | Development of better quality pasture legumes | 3.36 |
| 21. | Liming and fertilization methods for pastures | 3.36 |
| 22. | Prevention and control of calf scours | 3.36 |
| 23. | Protection of farmland from oil, gas and coal companies | 3.36 |
| 24. | Economic sources of N, P and K | 3.32 |
| 25. | Alfalfa stand establishment | 3.32 |
| 26. | Development of better quality pasture grasses | 3.32 |
| 27. | Low cost holding and handling facilities | 3.32 |
| 28. | Control of face fly | 3.32 |
| 29. | Need for improved livestock marketing system | 3.32 |
| 30. | Reducing capital investment on the farm | 3.32 |
| 31. | Development of energy efficient farm machinery | 3.32 |
| 32. | Fertility and reproduction problems (in livestock) | 3.27 |

**Table 4. (Continued)**

| Region 3 Parkersburg<br>Problem and Rank | Mean (n=18) | Region 4 Weston<br>Problem and Rank | Mean (n=18) |
|---|---|---|---|
| 1. Protection of farmland from oil, gas and coal companies | 3.83 | 1. Need for improved livestock marketing system | 3.78 |
| 2. Multiflora rose eradication | 3.78 | 2. Control of foot rot (sheep) | 3.50 |
| 3. Coping with high production costs and interest rates | 3.78 | 3. Control of face fly | 3.50 |
| 4. Improvement of state level funding for extension and vo-ag programs | 3.70 | 4. Multiflora rose eradication | 3.50 |
| 5. Control of pink eye | 3.61 | 5. Protection of farmland from oil, gas and coal companies | 3.44 |
| 6. Landowner rights in strip mine and oil field reclamation | 3.61 | 6. Application of lime on steep ground | 3.39 |
| 7. Increasing weaning weights of feeder calves through breeding and nutrition | 3.52 | 7. Hay making with limited labor | 3.39 |
| 8. Control of face fly | 3.48 | 8. Landowner rights in strip mining and oil field reclamation | 3.33 |
| 9. Means of getting started in farming | 3.48 | 9. Protection and control of early blight (beans, tomatoes, etc.) | 3.33 |
| 10. Economics of pick-your-own fruit and vegetable farming | 3.39 | 10. Increasing weaning weights of feeder calves through breeding and nutrition | 3.33 |
| 11. Direct marketing—farmer to retailer or consumer | 3.39 | 11. Prevention and control of calf scours | 3.33 |
| | | 12. Coping with high production costs and interest rates | 3.33 |

| | | |
|---|---|---|
| 12. | Chemical weed and brush control in pastures | 3.35 |
| 13. | Economic sources of N, P and K | 3.35 |
| 14. | Liming and fertilization methods for pasture | 3.35 |
| 15. | No-till pasture and meadow reseeding | 3.35 |
| 16. | Potential for commercial vegetable production, marketing and processing | 3.30 |
| 17. | Effective deer control methods | 3.30 |
| 18. | Development of grasses for acid soils | 3.30 |
| 19. | Hay making with limited labor | 3.30 |
| 20. | Need for improved livestock marketing | 3.30 |
| 21. | Budgeting for machinery, buildings, equipment and livestock | 3.30 |
| 22. | Farm management for small scale family or part-time farm operators | 3.30 |
| 23. | Farm land preservation and retention | 3.30 |
| 24. | Cultural practices in vegetable production | 3.26 |
| 25. | Development of better quality pasture legumes | 3.26 |
| 26. | Pasture renovation methods | 3.26 |
| 27. | Effect of laws and regulations on the farm community | 3.26 |



| | | |
|---|---|---|
| 13. | Farm estate planning | 3.33 |
| 14. | Chemical weed and brush control in pastures | 3.28 |
| 15. | Farm land preservation and retention | 3.28 |

**(continued)**

**Table 4. (Continued)**

| Region 5 Charleston<br>Problem and Rank | Mean (n=13) | Region 6 Beckley<br>Problem and Rank | Mean (n=17) |
|---|---|---|---|
| 1. Tobacco production and marketing | 3.77 | 1. Multiflora rose eradication | 3.76 |
| 2. Multiflora rose eradication | 3.77 | 2. Improving state level funding for extension and vo-ag programs | 3.71 |
| 3. Prevention and control of tobacco diseases | 3.62 | 3. Economic sources of N, P and K | 3.65 |
| 4. Chemical weed and brush control in pastures | 3.62 | 4. Control of pink eye | 3.63 |
| 5. Budgeting for machinery, building, equipment and livestock | 3.54 | 5. Coping with high production costs and interest rates | 3.54 |
| 6. Potential for commercial vegetable production | 3.46 | 6. Development of better quality pasture grasses | 3.56 |
| 7. Coping with high production costs and interest rates | 3.38 | 7. Liming and fertilization methods for pasture | 3.56 |
| 8. Practical and inexpensive soil erosion control measures | 3.38 | 8. Pasture renovation methods | 3.56 |
| 9. Protection of farmland from oil, gas and coal companies | 3.38 | 9. Increasing weaning weights of feeder calves through breeding and nutrition | 3.50 |
| 10. Improvement of state level funding for extension work and vo-ag programs | 3.38 | 10. Control of face fly | 3.50 |
| 11. Efficient methods of lime and fertilizer application for small farmers | 3.31 | 11. Control of foot rot (sheep) | 3.44 |
| | | 12. Alfalfa stand establishment | 3.41 |
| | | 13. Efficient methods of lime and fertilizer application for small farmers | 3.41 |

| | | |
|---|---|---|
| 12. | Economic sources of N, P and K | 3.31 |
| 13. | Control of Johnson grass | 3.31 |
| 14. | Roadside marketing | 3.31 |
| 15. | Agricultural safety | 3.31 |
| 16. | Landowner rights in strip mine and oil field reclamation | 3.31 |
| 14. | Chemical weed and brush control in pastures | 3.41 |
| 15. | Prevention of grass tetany | 3.38 |
| 16. | Development of quality pasture legumes | 3.36 |
| 17. | Cultural practices in vegetable production | 3.35 |
| 18. | Direct marketing—farmer to retailer or consumer | 3.35 |
| 19. | Budgeting for machinery, buildings, equipment and livestock | 3.35 |
| 20. | Farm estate planning | 3.35 |
| 21. | Ways of getting farmers organized to solve their own problems | 3.35 |
| 22. | Hay making with limited labor | 3.31 |
| 23. | No-till corn production practices | 3.29 |
| 24. | Maintaining quality in field stored large round bales | 3.29 |
| 25. | Chemical weed control in crops | 3.29 |
| 26. | Farmland preservation and retention | 3.29 |
| 27. | Effect of laws and regulations on the farm community | 3.29 |
| 28. | Development of grasses for acid soils | 3.25 |
| 29. | Prevention of calf scours | 3.25 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

Highest mean ratings, indicating exceptional importance in their respective regions, were given the following statements:

—Protection of farmland from oil, gas and coal companies (3.83 in Region 3)

—Multiflora rose eradication (3.78 in Region 3)

—Coping with high production costs and interest rates (3.78 in Region 3)

—Need for improved livestock marketing systems (3.78 in Region 4)

The data also reveal that respondents in Regions 2 and 6 perceived more problems to be of a serious nature (32 and 29, respectively) than did those in other regions. Region 4 participants rated the least number of problems (15) with means of 3.25 or above.

## Specific Problems Most in Need of Research Solutions

### Field Crop Production

West Virginia farmers produce a wide variety of field crops. Among the most important are corn, tobacco, and hay. Since crop production is becoming increasingly expensive, farmers must perform it as efficiently as possible if it is to be profitable. Major problems in field crop production most in need of research solutions are presented in Table 5. "Economic sources of N, P, and K" (3.35) and "Efficient methods of lime and fertilization application for small farmers" (3.28) were considered very important problems. Twelve of the remaining 16 items were considered important. Vocational agriculture teachers and county extension agents had similar perceptions of the problems identified in this category.

However, disparity in perception occurred in ratings by respondents when categorized by regions. Statements with variations in mean ratings exceeding 0.50 include: "Economic source of N, P and K," rated high (3.65) in Region 6 and low (3.11) in Region 4; "Economic lime usage," given a high rating (3.52) in Region 1 but a low rating (2.92) in Region 5; "Application of lime on steep land," rated high in Regions 1 and 4 but low in Region 5 (2.69); and "No-till corn production practices," rated high in Regions 2 and 6 but low in other regions.

An exceptional variation occurred in perceptions of need for research in "Tobacco production and marketing." All respondents except those in Region 5 (Charleston) gave this problem very low ratings. Respondents in Region 5 gave it the highest rating in the category (3.77). This is undoubtedly due to the fact that tobacco is an important crop only in this particular region.

**Table 5.**
Specific problems in field crop production most in need of research solutions

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Economic sources of N, P, and K | 3.33 | 3.41 | 3.39 | 3.32 | 3.35 | 3.11 | 3.31 | 3.65 | 3.35 | 0.70 |
| 2. Efficient methods of lime and fertilization application for small farmers | 3.25 | 3.32 | 3.22 | 3.41 | 3.22 | 3.11 | 3.31 | 3.41 | 3.28 | 0.76 |
| 3. Economic lime usage | 3.09 | 3.22 | 3.52 | 3.00 | 3.09 | 3.00 | 2.92 | 3.12 | 3.13 | 0.69 |
| 4. Application of lime on steep land | 3.06 | 3.16 | 3.43 | 2.82 | 3.09 | 3.39 | 2.69 | 3.00 | 3.09 | 0.86 |
| 5. Alfalfa stand establishment | 3.01 | 3.19 | 3.13 | 3.32 | 2.91 | 2.50 | 3.15 | 3.41 | 3.07 | 0.81 |
| 6. Maintaining quality in field stored large round bales | 3.06 | 2.89 | 2.91 | 3.14 | 3.13 | 2.94 | 2.46 | 3.29 | 3.01 | 0.96 |
| 7. No-till corn production practices | 2.91 | 2.86 | 2.96 | 3.41 | 2.52 | 2.50 | 2.62 | 3.29 | 2.90 | 0.95 |
| 8. Soil fertility improvement without use of commercial fertilizer and lime | 2.77 | 2.81 | 2.74 | 2.77 | 2.70 | 2.72 | 3.00 | 2.88 | 2.78 | 0.97 |
| 9. Development of 'deer resistant' crop varieties | 2.76 | 2.73 | 2.61 | 3.18 | 2.96 | 2.94 | 2.15 | 2.35 | 2.75 | 1.10 |
| 10. Silage production vs haymaking (economic comparison) | 2.82 | 2.49 | 2.52 | 2.95 | 2.70 | 2.89 | 2.15 | 2.94 | 2.72 | 0.90 |
| 11. Potential multicropping systems | 2.66 | 2.65 | 2.74 | 3.09 | 2.39 | 2.28 | 2.54 | 2.82 | 2.66 | 0.81 |

**(continued)**

**Table 5. (continued)**

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 12. Corn variety yield and nutrition | 2.70 | 2.54 | 2.61 | 2.91 | 2.39 | 2.67 | 2.69 | 2.65 | 2.65 | 0.93 |
| 13. Optimum organic matter levels for specific crops | 2.54 | 2.65 | 2.48 | 2.50 | 2.61 | 2.28 | 3.15 | 2.65 | 2.58 | 0.83 |
| 14. Development of seed for cool weather germination | 2.54 | 2.49 | 2.65 | 2.50 | 2.22 | 2.78 | 2.23 | 2.76 | 2.53 | 0.93 |
| 15. Effect of fertilizer on heavy metal uptake | 2.11 | 2.43 | 2.30 | 2.14 | 2.17 | 2.06 | 2.54 | 2.18 | 2.22 | 0.91 |
| 16. Sewage sludge use on farms | 1.87 | 2.35 | 2.26 | 2.05 | 1.87 | 1.89 | 2.15 | 1.94 | 2.03 | 1.00 |
| 17. Oat and barley yield & nutritional value testing | 1.94 | 1.89 | 2.09 | 2.40 | 1.57 | 1.94 | 1.38 | 1.94 | 1.92 | 0.88 |
| 18. Tobacco production and marketing | 1.72 | 1.78 | 1.09 | 1.23 | 2.35 | 1.22 | 3.77 | 1.47 | 1.74 | 1.17 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

## Horticulture

The production of horticultural crops also is important to the economy of West Virginia, with a variety of fruits[3] and vegetables being produced for both local and distant markets. There appears to be great potential for expansion.

Table 6 presents information concerning problem areas in the horticulture industry which need research attention. On examination of the data, it appears that none of the problems identified were considered crucial. Overall, ratings of all items were in the "important" category.

In all statements there was considerable agreement between vocational agriculture teachers and county extension agents. Both groups rated all items to be important (2.24–3.24) except for Statement 10, which was given a mean rating of 2.16 by county extension agents. The top rating for importance given by both groups was for "Potential for commercial vegetable production and processing." In general, vocational agriculture teachers indicated greater concern for horticultural problems than did county extension agents.

There was very little variation in perceptions of horticultural problems by region. However, "Potential for commercial vegetable production and marketing" was rated somewhat higher by participants from Regions 3 and 5 (Parkersburg and Charleston). Respondents in Region 4 (Weston) gave lower mean ratings on nearly all the statements in this category.

## Plant Pest/Disease Management

Plant pests and diseases are major problems affecting agricultural production. Although much research has been done in this field, problems continue to threaten the industry. Table 7 shows the major problems in need of research solutions in plant pest/disease management as perceived by the respondents. Multiflora rose eradication and chemical weed and brush control in pastures are the most serious problems (mean of 3.63 and 3.40) in this category. All problems were considered important except for "Prevention and control of tobacco diseases," which was given the lowest overall rating (1.69).

There was close agreement between vocational agriculture teachers and county extension agents regarding importance of problems identified. Both groups ranked "Multiflora rose eradication" as the number one problem, followed by "Chemical weed and brush control in pastures." However, county extension agents gave higher ratings for these problems than did vocational agriculture teachers. Both groups also considered "Prevention and control of tobacco diseases" the least important problem in this category.

Although respondents in all regions considered multiflora rose eradication as a very serious problem, there was considerable variation in perception with respect to other statements; for example, control of weeds, Johnson grass,

[3]West Virginia is one of the top ten states in the production of apples and peaches in the U.S.

**Table 6.**
Specific problems in horticulture most in need of research solutions

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Potential for commercial vegetable production and processing | 3.10 | 2.95 | 3.13 | 3.05 | 3.30 | 2.33 | 3.46 | 3.06 | 3.05 | 0.83 |
| 2. Cultural practices in small fruit production | 3.00 | 2.92 | 2.91 | 3.05 | 3.13 | 2.50 | 3.08 | 3.18 | 2.97 | 0.76 |
| 3. Potential for commercial small fruit production | 2.92 | 2.86 | 2.87 | 3.00 | 2.96 | 2.61 | 2.92 | 2.94 | 2.91 | 0.83 |
| 4. Cultural practices in fruit production | 2.76 | 2.78 | 2.52 | 3.00 | 2.74 | 2.50 | 2.96 | 3.00 | 2.77 | 0.77 |
| 5. Potential for greenhouse production of bedding and ornamental plants | 2.76 | 2.59 | 2.65 | 2.86 | 2.70 | 2.39 | 2.77 | 2.88 | 2.71 | 0.83 |
| 6. Potential for grape production (fresh fruit & wine) | 2.73 | 2.54 | 2.83 | 2.74 | 2.57 | 2.50 | 3.00 | 2.59 | 2.60 | 0.94 |

**Table 6. (continued)**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 7. Cultural practices in greenhouse plant production | 2.64 | 2.57 | 2.57 | 2.73 | 2.61 | 2.11 | 3.00 | 2.82 | 2.62 | 0.86 |
| 8. Potential for commercial fruit production, marketing and processing | 2.64 | 2.54 | 2.30 | 2.77 | 2.87 | 2.06 | 2.92 | 2.80 | 2.61 | 0.90 |
| 9. Grape variety testing | 2.26 | 2.35 | 2.26 | 2.36 | 2.17 | 2.22 | 2.54 | 2.29 | 2.29 | 0.94 |
| 10. The potential for specialized agriculture (mushrooms, garlic, etc.) in low income counties | 2.28 | 2.16 | 2.30 | 2.18 | 2.35 | 2.00 | 2.23 | 2.35 | 2.24 | 1.03 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

**Table 7.**
Specific problems in pest/disease management most in need of research solutions

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Multiflora rose eradication | 3.58 | 3.73 | 3.43 | 3.64 | 3.78 | 3.44 | 3.77 | 3.76 | 3.63 | 0.70 |
| 2. Chemical weed and brush control in pastures | 3.30 | 3.59 | 3.43 | 3.36 | 3.35 | 3.28 | 3.62 | 3.41 | 3.40 | 0.76 |
| 3. Chemical weed control in crops | 3.22 | 3.22 | 3.17 | 3.55 | 3.13 | 2.89 | 3.23 | 3.29 | 3.22 | 0.80 |
| 4. Presentation and control of early blight (beans, tomatoes, etc.) | 3.20 | 2.97 | 2.96 | 3.05 | 3.09 | 3.33 | 3.23 | 3.24 | 3.13 | 0.75 |
| 5. Economic pest control techniques for small farmers | 3.04 | 3.05 | 3.09 | 3.09 | 3.04 | 2.89 | 2.92 | 3.18 | 3.04 | 0.68 |
| 6. Control of gypsy moth | 2.95 | 3.14 | 2.83 | 3.45 | 3.17 | 2.83 | 2.31 | 3.18 | 3.01 | 0.93 |
| 7. Effective deer control methods | 2.92 | 3.05 | 2.91 | 3.41 | 3.30 | 3.22 | 2.31 | 2.24 | 2.97 | 1.09 |
| 8. Prevention and control of brown root rot in beans | 2.81 | 3.03 | 2.78 | 2.55 | 3.00 | 2.83 | 3.15 | 3.12 | 2.88 | 0.85 |
| 9. Control of Johnson grass | 2.84 | 2.95 | 2.13 | 3.55 | 3.04 | 2.56 | 3.31 | 2.76 | 2.87 | 0.99 |

**Table 7. (continued)**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 10. Integrated pest management techniques | 2.92 | 2.70 | 2.96 | 3.05 | 2.91 | 2.51 | 2.60 | 2.76 | 2.86 | 0.70 |
| 11. Control of army worm (corn) in wet weather | 2.82 | 2.86 | 2.87 | 3.09 | 2.57 | 2.56 | 2.92 | 3.06 | 2.84 | 0.80 |
| 12. Chemical weed control for family gardens | 2.82 | 2.67 | 2.70 | 3.05 | 2.91 | 2.61 | 2.62 | 2.65 | 2.78 | 0.85 |
| 13. Control of Japanese beetle | 2.80 | 2.70 | 2.83 | 2.91 | 2.52 | 2.72 | 2.46 | 3.12 | 2.77 | 0.78 |
| 14. Prevention and control of ground moles in lawns | 2.34 | 2.92 | 2.74 | 2.27 | 2.74 | 2.33 | 2.54 | 2.47 | 2.53 | 1.00 |
| 15. Control of autumn olive | 2.38 | 2.73 | 2.57 | 2.68 | 2.70 | 2.56 | 1.92 | 2.24 | 2.49 | 1.07 |
| 16. Control soil borne diseases in intensively used soils | 2.46 | 2.54 | 2.30 | 2.73 | 2.52 | 2.22 | 2.54 | 2.59 | 2.48 | 0.91 |
| 17. Nematode control in gardens | 2.47 | 2.19 | 2.39 | 2.55 | 2.35 | 2.17 | 2.08 | 2.65 | 2.38 | 0.73 |
| 18. Prevention and control of potato scab | 2.41 | 2.19 | 2.48 | 2.18 | 2.30 | 2.28 | 2.31 | 2.47 | 2.34 | 0.72 |
| 19. Prevention and control of tobacco diseases | 1.72 | 1.62 | 1.13 | 1.32 | 2.09 | 1.28 | 3.62 | 1.35 | 1.69 | 1.07 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important

gypsy moth, and deer were perceived "very important" in Region 2 (Keyser) but only "important" in other regions.

In general, respondents in Region 2 considered problems in this category to be more serious than did those in other regions.

## Pasture Management

Pasture management is the science and art of managing forage resources in order to produce livestock/dairy products at reasonable prices for consumers and acceptable net profits for producers. Table 8 presents the major problems in pasture management as perceived by the two respondent groups. All statements received overall mean ratings above 3.00 except statement 9, rated very low (2.05), which dealt with a problem specific to the Eastern Panhandle of the state. The top ratings for importance were for: Liming and fertilization methods for pasture (3.35); Hay making with limited labor (3.30); and Development of quality pasture grasses and Pasture renovation methods (3.25).

Variations in perceptions between vocational agriculture teachers and county extension agents were noted in certain statements. There was slight disagreement with regard to importance of "Hay making with limited labor," rated somewhat more important by vocational agriculture teachers (3.37) than by county extension agents (3.17); and "Development of grasses for acid soils," perceived to be more important by county extension agents (3.36) than by vocational agriculture teachers (3.00).

Regional differences in perception also were evident in several statements. The regional top ratings were for: Liming and fertilization methods for pasture in Regions 1, 3 and 6; Hay making with limited labor in Region 4; Pasture renovation methods in Regions 5 and 6; Development of quality pasture grass in Region 6; Forage for shale lands in eastern West Virginia in Region 2. In general, respondents in Region 6 (Beckley) perceived items in this category to be greater problems than did those in other regions.

## Livestock Production

Livestock, dairy, and poultry production are major agricultural enterprises in West Virginia. Among the most important animals found in the state are cattle (beef and dairy), hogs, chickens, and sheep. The potential for increased production exists. Problems relating to livestock production and which were noted to require research attention are presented in Table 9. More problems were identified in livestock production than in any other category.

The following were considered "very important" by respondents: Increasing weaning weights of feeder calves through breeding and nutrition (3.39); Control of pink eye (3.38); and Control of face fly (3.31). Except for "Dairy goat management and milk processing," all the remaining problems were considered "important" (2.25–3.24).

**Table 8.**
Specific problems in pasture management most in need of research solutions

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Liming and fertilization methods for pasture | 3.35 | 3.33 | 3.48 | 3.35 | 3.35 | 3.11 | 3.15 | 3.56 | 3.35 | 0.65 |
| 2. Hay making with limited labor | 3.37 | 3.17 | 3.35 | 3.41 | 3.30 | 3.39 | 2.92 | 3.31 | 3.30 | 0.79 |
| 3. Development of quality pasture grasses | 3.24 | 3.28 | 3.39 | 3.32 | 2.17 | 3.00 | 3.00 | 3.56 | 3.25 | 0.71 |
| 4. Pasture renovation methods | 3.24 | 3.28 | 3.43 | 3.05 | 3.26 | 3.00 | 3.23 | 3.56 | 3.25 | 0.69 |
| 5. Development of quality pasture legumes | 3.28 | 3.14 | 3.39 | 3.35 | 3.26 | 2.89 | 3.00 | 3.38 | 3.23 | 0.68 |
| 6. Development of grasses for acid soils | 3.00 | 3.36 | 3.26 | 2.73 | 3.30 | 3.22 | 2.85 | 3.25 | 3.11 | 0.80 |
| 7. Extended grazing season methods | 3.14 | 3.06 | 3.17 | 3.41 | 3.22 | 3.06 | 2.46 | 3.06 | 3.11 | 0.78 |
| 8. No-till pasture and meadow reseeding | 3.10 | 2.97 | 3.13 | 3.14 | 3.35 | 2.78 | 2.62 | 3.13 | 3.06 | 0.84 |
| 9. Forage for shale lands in eastern West Virginia | 2.13 | 1.89 | 1.48 | 3.50 | 1.56 | 2.06 | 1.31 | 2.19 | 2.05 | 1.17 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

**Table 9.**
Specific problems in livestock production most in need of research solutions

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Increasing weaning weights of feeder calves through breeding and nutrition | 3.43 | 3.31 | 3.30 | 3.59 | 3.52 | 3.33 | 2.92 | 3.50 | 3.39 | 0.79 |
| 2. Control of pink eye | 3.39 | 3.36 | 3.30 | 3.50 | 3.60 | 3.22 | 2.85 | 3.63 | 3.38 | 0.76 |
| 3. Control of face fly | 3.24 | 3.47 | 3.17 | 3.32 | 3.48 | 3.50 | 2.77 | 3.50 | 3.31 | 0.76 |
| 4. Low cost holding and handling facilities | 3.16 | 3.14 | 3.17 | 3.32 | 3.22 | 3.17 | 2.69 | 3.19 | 3.16 | 0.81 |
| 5. Prevention and control of calf scours | 3.13 | 3.11 | 3.09 | 3.36 | 2.91 | 3.33 | 2.69 | 3.25 | 3.12 | 0.80 |
| 6. Prevention of grass tetany | 3.22 | 2.92 | 3.39 | 3.22 | 3.04 | 3.00 | 2.46 | 3.38 | 3.12 | 0.87 |
| 7. Control of foot rot (sheep) | 3.06 | 3.06 | 3.30 | 3.00 | 2.91 | 3.50 | 1.92 | 3.44 | 3.06 | 1.01 |
| 8. Prevention of lepto | 3.08 | 3.03 | 3.04 | 3.14 | 3.22 | 3.00 | 2.85 | 3.00 | 3.06 | 0.85 |
| 9. Fertility and reproduction problems | 3.00 | 3.00 | 3.13 | 3.27 | 2.91 | 2.78 | 2.77 | 3.00 | 3.00 | 0.82 |
| 10. Economics of using beef cattle production testing (BCPT) programs | 2.85 | 2.89 | 3.00 | 2.95 | 2.70 | 2.83 | 2.54 | 3.06 | 2.85 | 0.85 |
| 11. Estrus synchronization and heat detection in artificial insemination (sheep and cattle) | 2.91 | 2.71 | 2.78 | 2.91 | 2.61 | 3.06 | 2.77 | 3.06 | 2.85 | 0.85 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 12. Prevention of shipping fever in nursing calves | 2.89 | 2.75 | 2.78 | 2.95 | 2.65 | 3.00 | 2.54 | 3.13 | 2.85 | 0.85 |
| 13. Production of feeder pigs | 2.94 | 2.58 | 2.52 | 3.18 | 2.96 | 2.50 | 2.92 | 2.88 | 2.89 | 0.89 |
| 14. Control of internal parasites in nursing calves | 2.80 | 2.81 | 2.87 | 2.77 | 2.57 | 3.11 | 2.38 | 3.06 | 2.80 | 0.84 |
| 15. Mastitis prevention | 2.72 | 2.69 | 2.87 | 3.05 | 2.35 | 2.61 | 2.46 | 2.88 | 2.77 | 1.00 |
| 16. Small scale (backyard) livestock production | 2.68 | 2.97 | 2.74 | 3.00 | 2.91 | 2.61 | 2.85 | 2.44 | 2.71 | 0.95 |
| 17. Cost effective production of small livestock (poultry, rabbit, etc.) management, marketing, etc. | 2.65 | 2.72 | 2.87 | 2.68 | 2.87 | 2.44 | 2.62 | 2.38 | 2.67 | 0.94 |
| 18. Development of pour-on insecticide for sheep | 2.53 | 2.86 | 2.61 | 2.59 | 2.87 | 3.00 | 1.92 | 2.63 | 2.63 | 0.88 |
| 19. Prevention and control of lamb scours | 2.51 | 2.69 | 2.57 | 2.73 | 2.48 | 2.89 | 1.77 | 2.75 | 2.57 | 0.87 |
| 20. Control of respiratory diseases (sheep) | 2.49 | 2.56 | 2.43 | 2.73 | 2.48 | 2.72 | 1.85 | 2.69 | 2.51 | 0.85 |
| 21. Increasing dairy production and profits through breeding and nutrition | 2.48 | 2.25 | 2.57 | 2.77 | 2.00 | 2.17 | 2.08 | 2.81 | 2.41 | 1.14 |
| 22. Swine production testing | 2.48 | 2.19 | 2.17 | 2.73 | 2.43 | 2.22 | 2.46 | 2.31 | 2.39 | 1.00 |
| 23. Dairy goat management and milk processing | 1.95 | 2.22 | 2.13 | 1.95 | 2.09 | 1.83 | 2.62 | 1.69 | 2.03 | 0.92 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important

With regard to group perception, data show that there was strong agreement between vocational agriculture teachers and county extension agents. The greatest difference of opinion occurred with regard to "Production of feeder pigs," which vocational agriculture teachers perceived to be of greater importance than did extension agents (means of 2.94 and 2.58, respectively).

There was disagreement regarding the importance of certain problems among respondents in various regions. Major disagreements occurred in ranking the following: Increasing weaning weights of feeder calves through breeding and nutrition, considered the number one item in Regions 2 and 5; Control of pink eye, the most serious problem identified in Regions 3 and 6; Control of face fly, a very important problem in Region 4; and Prevention of grass tetany, rated very high in Region 1.

Further observation of the data reveals two interesting features. First, respondents in Region 5 (Charleston) were somewhat less concerned with nearly all problems identified in the category than were those from other regions. Second, no problem in poultry production was identified by study participants as a major problem in need of research.

## Agricultural Marketing

Marketing of farm products is part of the total productive process and is an essential element in a well-organized agricultural industry. Table 10 presents data on the perceptions of vocational agriculture teachers and county extension agents regarding the importance of problems in marketing. All problems in this category were considered important, with mean ratings between 2.25–3.24. "Need for improved livestock marketing systems" ranked highest.

Data in Table 10 also indicate that perceptions of the two groups of respondents were similar. All statements were rated important except "Use of futures contracts in marketing," which was considered only somewhat important (2.19) by county extension agents.

Respondents in various regions differed somewhat in their perceptions of problems in this category. The greatest variations occurred in the following items (mean rating difference $> 0.60$): "Economics of pick-your-own fruit and vegetables," with mean ratings of 3.34 in Region 3 and 2.61 in Region 4; "Effects on sheep production if processing plants were located in West Virginia," with means of 3.25 in Region 2 and 2.15 in Region 5; "Need for lamb slaughtering facilities," with means of 3.09 in Region 2 and 1.92 in Region 5; and "Economics of bulk grain shipment (pooling of resources)," with means of 2.83 in Region 1 and 2.22 in Region 4.

The item considered most important in each region was: Need for improved livestock marketing systems, in Regions 1, 2 and 4; Direct marketing—farmer to retailer and/or consumer, in Regions 3 and 6; and Roadside marketing, in Region 5.

**Table 10.**
Specific problems in agricultural marketing and processing most in need of research solutions

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Need for improved livestock marketing systems | 3.20 | 3.24 | 3.26 | 3.32 | 3.30 | 3.28 | 2.77 | 3.18 | 3.22 | 0.82 |
| 2. Direct marketing—farmer to retailer or consumer | 3.22 | 3.05 | 2.91 | 3.09 | 3.39 | 3.17 | 3.08 | 3.35 | 3.16 | 0.70 |
| 3. Economics of pick-your-own fruit and vegetables | 3.14 | 3.05 | 3.04 | 3.23 | 3.39 | 2.61 | 3.23 | 3.12 | 3.11 | 0.86 |
| 4. Roadside marketing | 2.95 | 2.81 | 2.87 | 2.86 | 3.04 | 2.61 | 3.31 | 2.82 | 2.91 | 0.86 |
| 5. Effects on sheep production if processing plants were located in West Virginia | 2.73 | 3.08 | 2.74 | 3.23 | 2.91 | 2.78 | 2.15 | 3.00 | 2.84 | 1.02 |
| 6. Improvement of farm to market road system | 2.82 | 2.70 | 2.78 | 2.77 | 3.00 | 2.56 | 3.08 | 2.53 | 2.78 | 0.89 |
| 7. Need for lamb slaughtering facilities | 2.62 | 2.81 | 2.57 | 3.09 | 2.51 | 2.67 | 1.92 | 3.00 | 2.68 | 1.06 |

**(continued)**

**Table 10. (continued)**

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 8. Need for small-scale food processing plants | 2.70 | 2.49 | 2.65 | 2.64 | 2.70 | 2.28 | 2.77 | 2.82 | 2.64 | 1.04 |
| 9. Economics of 'bulk grain shipment' (pooling of resources) | 2.65 | 2.30 | 2.83 | 2.59 | 2.61 | 2.22 | 2.31 | 2.48 | 2.53 | 1.01 |
| 10. Electronic marketing | 2.43 | 2.54 | 2.35 | 2.77 | 2.43 | 2.44 | 2.31 | 2.41 | 2.47 | 0.89 |
| 11. Use of futures contracts in marketing | 2.33 | 2.19 | 2.43 | 2.45 | 2.30 | 1.94 | 2.31 | 2.18 | 2.28 | 0.95 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

## Farm Management

Conditions in farming are changing rapidly throughout the United States. Farming is a much more complex and highly capitalized undertaking than it has been in the past. Farmers must practice sound business management if they are to survive in the years ahead. Table 11 presents 13 problems in farm management which, according to vocational agriculture teachers and county extension agents, need research solutions. The following were rated the most important (with overall mean ratings above 3.25): Coping with high production costs and interest rates; Budgeting for machinery, buildings, equipment and livestock; and Farm estate planning. All remaining items were considered important, with mean ratings ranging from 2.61 to 3.21.

Further examination of data reveals that close agreement existed between perceptions of vocational agriculture teachers and county extension agents concerning the problems identified. However, vocational agriculture teachers tended to consider the problems more severe than did county extension agents.

When analyzed by regions, some disagreement appears. Statements with variations of mean ratings exceeding 0.50 include: "Budgeting for machinery, buildings, equipment and livestock," with mean ratings above 3.25 in all regions except Region 4 (2.22); "Farm estate planning," given a very high rating (3.68) in Region 2 but low rating (2.85) in Region 5; and "Means of getting started in farming," rated much higher in Region 3 (3.48) than in Region 4 (2.94).

Except for those in Region 5, participants in all other regions considered "Coping with high production costs and interest rates" the major problem in the category. Participants in Region 5 considered "Budgeting for machinery, buildings, equipment and livestock" their most important farm management problem.

## Farm Machinery and Structures

Farm machinery includes all items on the farm which help make farm work easier to perform. Modern farming necessitates the use of expensive machinery as well as structures designed for specific uses. Data relating to problems in farm machinery and structures are recorded in Table 12. The overall mean ratings indicate that all the statements were perceived to be important (2.25–3.24); however, "Agricultural safety" was given the highest rating (3.16).

Vocational agriculture teachers considered "Agricultural safety" a very important problem (3.29), while county extension agents rated it much lower (2.89). To county extension agents, "Development of energy efficient machinery" was considered the major problem (3.03) in this category.

Observations of mean ratings on a regional basis show only slight variations in perceptions of participants. Disagreements were noted in the following

**Table 11.**
Specific problems in farm management most in need of research solutions

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=17 | Regions 6 n=13 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Coping with high production costs and interest rates | 3.61 | 3.43 | 3.39 | 3.73 | 3.78 | 3.33 | 3.38 | 3.58 | 3.55 | 0.69 |
| 2. Budgeting for machinery, buildings, equipment and livestock | 3.46 | 3.18 | 3.26 | 3.59 | 3.30 | 2.22 | 3.54 | 3.35 | 3.37 | 0.72 |
| 3. Farm estate planning | 3.37 | 3.16 | 3.22 | 3.68 | 3.22 | 3.33 | 2.85 | 3.35 | 3.30 | 0.71 |
| 4. Means of getting started in farming | 3.29 | 3.03 | 3.26 | 3.14 | 3.48 | 2.94 | 3.23 | 3.12 | 3.21 | 0.84 |
| 5. Reducing capital investment on the farm | 3.14 | 3.24 | 3.04 | 3.32 | 3.22 | 3.22 | 3.08 | 3.12 | 3.17 | 0.81 |
| 6. Farm management for small scale family or part-time farm operations | 3.16 | 3.16 | 3.09 | 3.00 | 3.30 | 3.22 | 3.23 | 3.18 | 3.16 | 0.73 |
| 7. Cost/profit analysis of recommended practices | 3.00 | 3.08 | 3.04 | 3.05 | 3.22 | 2.83 | 3.23 | 2.76 | 3.03 | 0.82 |
| 8. Farm business agreements (renting and leasing) | 3.00 | 2.70 | 2.70 | 3.14 | 2.78 | 2.83 | 2.77 | 3.24 | 2.91 | 0.86 |

**Table 11. (continued)**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 9. Influences of increased population on farmland | 2.90 | 2.86 | 2.78 | 2.86 | 2.70 | 2.50 | 2.77 | 2.94 | 2.76 | 0.87 |
| 10. Economics of alternative crops and livestock systems | 2.80 | 2.68 | 2.78 | 2.86 | 2.70 | 2.50 | 2.77 | 2.94 | 2.76 | 0.88 |
| 11. The need for new and different agribusiness programs | 2.71 | 2.59 | 2.26 | 2.91 | 2.96 | 2.39 | 2.77 | 2.76 | 2.67 | 0.86 |
| 12. Control of commodity prices by producers | 2.63 | 2.65 | 2.65 | 2.91 | 2.39 | 2.44 | 2.60 | 2.76 | 2.64 | 0.88 |
| 13. Application of home computers and development of programs for agriculture | 2.64 | 2.49 | 2.57 | 2.91 | 2.48 | 2.56 | 2.31 | 2.76 | 2.61 | 1.02 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

**Table 12.**
Specific problems in farm machinery and structures most in need of research solutions

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Agricultural safety | 3.29 | 2.89 | 3.13 | 3.23 | 2.13 | 3.05 | 3.31 | 3.18 | 3.16 | 0.77 |
| 2. Fences: building, repairing, maintenance | 3.14 | 3.00 | 3.09 | 3.23 | 2.96 | 3.17 | 3.15 | 3.00 | 3.09 | 0.72 |
| 3. Development of energy efficient machinery | 3.10 | 3.03 | 3.00 | 3.32 | 2.87 | 3.00 | 3.15 | 3.18 | 3.08 | 0.71 |
| 4. Farm machinery selection and economics | 2.97 | 2.94 | 2.91 | 3.09 | 2.87 | 2.94 | 2.92 | 3.06 | 2.97 | 0.77 |
| 5. Economic methods of machinery storage | 2.90 | 2.54 | 2.83 | 3.00 | 2.65 | 2.94 | 2.54 | 2.76 | 2.80 | 0.82 |
| 6. Economic methods of storing corn | 2.61 | 2.35 | 2.35 | 2.95 | 2.48 | 2.22 | 2.60 | 2.47 | 2.53 | 0.84 |
| 7. Economic methods of storing grass silage | 2.58 | 2.32 | 2.61 | 2.81 | 2.30 | 2.39 | 2.23 | 2.53 | 2.50 | 0.93 |
| 8. Need for farm machinery dealership and service centers | 2.63 | 2.16 | 2.52 | 2.45 | 2.52 | 2.50 | 2.62 | 2.29 | 2.48 | 0.97 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

statements: Development of energy efficient machinery, rated somewhat lower in Region 3 than in other regions; Economic methods of storing corn, rated somewhat less important in Region 4 than in other regions; and Economic methods of storing grass silage, considered somewhat less important in Region 5 than in other regions. "Agricultural safety" was perceived as the major problem in the category in all regions except in Region 2, where "Development of energy efficient machinery" was rated the leading problem.

## Soil and Water Conservation

Table 13 displays the four problems in soil/water conservation which, according to participants in this study, need research attention. Overall mean ratings indicated that respondents considered three items as important (means above 2.25) and the remaining problem somewhat important (1.91). The item, "Practical and inexpensive soil erosion control measures," was perceived to be of considerably greater importance than the others.

Although there was considerable agreement between vocational agriculture teachers and county extension agents, there were differences of opinions when statements were categorized by regions, especially with respect to statements perceived least important overall. "Water management systems" was perceived much more important in Regions 2 and 5 than in other regions, and "Mine subsidence problems" was rated much more important by participants in Region 1 (Morgantown) than by those in other regions.

## Agricultural Energy

American agriculture depends heavily on energy derived from coal, petroleum, and natural gas. Such farm operations as tillage, planting, fertilizer and pesticide application, harvesting, transportation, and production of livestock are highly mechanized and require large quantities of petroleum fuels. Agricultural chemicals, including pesticides, herbicides, and some fertilizers, are derived from fossil fuels (petroleum and natural gas). Crop drying also employs large quantities of LP gas, natural gas, and fuel oil. The entire United States food system (production, processing, distribution, and preparation) uses 16.5 percent of the total energy consumed nationally (Joint Council on Food and Agricultural Sciences, 1981:12). Success in today's highly sophisticated agricultural methods has been achieved partly due to the availability of inexpensive petroleum and other energy supplies. However, recent developments in the energy markets are reversing the trend—energy is no longer cheap. This means higher production costs and lower profits to farmers. The energy issue has tremendous implications to research scientists.

Data in Table 14 deal with problems associated with agricultural energy identified by vocational agriculture teachers and county extension agents which

**Table 13.**
Specific problems in soil and water conservation most in need of research solutions

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Practical and inexpensive soil erosion and control measures | 3.23 | 3.14 | 3.39 | 2.14 | 3.17 | 3.00 | 3.38 | 3.12 | 3.20 | 0.70 |
| 2. Land classification techniques (i.e., what is land good for—pastures, crops, trees, game) | 2.80 | 2.38 | 2.91 | 2.64 | 2.61 | 2.61 | 2.62 | 2.53 | 2.66 | 0.84 |
| 3. Water management systems, e.g., supplementary irrigation to increase agricultural production | 2.42 | 2.24 | 2.17 | 2.95 | 2.04 | 2.00 | 2.92 | 2.24 | 2.36 | 0.90 |
| 4. Mine subsidence problems | 1.89 | 1.95 | 2.52 | 1.50 | 1.47 | 2.11 | 1.85 | 2.00 | 1.91 | 1.05 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

**Table 14.**
Specific problems in agricultural energy most in need of research solutions

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Farm energy conservation methods | 3.04 | 2.89 | 3.00 | 3.23 | 2.78 | 3.00 | 3.08 | 2.88 | 2.99 | 0.73 |
| 2. Development of alternative energy sources | 3.01 | 2.73 | 3.00 | 3.23 | 2.70 | 2.94 | 2.77 | 2.82 | 2.66 | 0.72 |
| 3. Potential for solar energy and other alternatives in greenhouse heating | 2.71 | 2.49 | 2.52 | 2.95 | 2.39 | 2.33 | 2.60 | 3.00 | 2.64 | 1.03 |
| 4. Fuel alcohol production | 2.54 | 2.16 | 2.48 | 2.73 | 2.22 | 2.33 | 2.38 | 2.35 | 2.42 | 0.88 |
| 5. Methane production from manure, etc. | 2.52 | 2.14 | 2.17 | 3.00 | 2.09 | 2.33 | 2.46 | 2.35 | 2.40 | 0.96 |
| 6. Underground passive solar livestock buildings | 2.30 | 1.95 | 2.17 | 2.55 | 1.74 | 2.11 | 2.31 | 2.35 | 2.19 | 0.93 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

need research solutions in West Virginia. Although they cited "Farm energy conservation methods" to be, by far, the most important item in the category (mean rating of 2.99), need for research in solar energy, fuel alcohol, and methane production was also considered important.

Vocational agriculture teachers considered each of the items dealing with agricultural energy to be considerably greater in importance than did extension agents. However, both groups agreed that research in "Farm energy conservation methods" was most important.

Some disparities in perception among respondents in the regions can be noted. Statements with differences in mean ratings exceeding 0.50 include: Development of alternative energy sources, rated high (3.24) in Region 2 and low (2.70) in Region 3; Potential for solar energy and other alternatives in greenhouse heating, rated high (3.00) in Region 6 and low (2.33) in Region 4; Methane production from manure, etc., and Underground passive solar livestock buildings, rated high in Region 2 and very low in Region 3. "Farm energy conservation methods" was rated most important except in Region 6, where participants considered "Fuel alcohol production" a more important problem.

## Rural Development, Extension and Education

Agriculture requires both technical skills and managerial abilities of those engaged in it. Vocational agriculture teachers and county extension agents help provide farmers with these basic skills. It is imperative that research institutions continue to develop new technologies that agricultural educators can take to farmers. Close links between the two groups also are essential if agriculture is to continue to make its important contribution to the economy of the state.

Table 15 presents data regarding the importance of problems relating to rural development, extension and education as perceived by vocational agriculture teachers and county extension agents. "Improvement of state level funding for extension and vo-ag programs" was given the highest rating (3.52) in the category. Four other items, concerning protection and preservation of farmland and effect of laws and regulations on the farm community, were also considered "very important." All remaining statements were regarded as "important" by participants.

The data also reveal disagreements between vocational agriculture teachers and county extension agents, particularly with respect to the following: Job satisfaction of vo-ag teachers; Accountability of vo-ag programs; and Adapting vo-ag to decreasing funding levels. As might be expected, these statements were given higher importance by vocational agriculture teachers than by county extension agents.

Disparity in opinion was also noted among the regional responses. Major divergencies, with differences in mean ratings of 0.50 or greater, appeared in the rating of the following statements: Protection of farmland from oil, gas and coal companies and Land owner rights in strip mine and oil field reclamation, were rated high in Region 3, but lower by participants in Regions 2 and 6; Ways of getting farmers to organize to solve their own problems, considered very important in Region 6, but much lower in Region 4; Accountability of vo-ag programs and Adapting vo-ag to decreasing funding levels, rated somewhat less important in Region 4 than in other regions; and Impact of tourism on the local community, rated much more important by participants in Region 3 than by others.

However, the regional top ratings for importance were for Improvement of state level funding for extension and vo-ag programs, in Regions 2, 5 and 6, and Protection of farmland from oil, gas and coal companies, in Regions 1, 3, 4 and 5.

## Summary

The purpose of this study was to identify problems in agriculture most in need of research solutions as perceived by vocational agriculture teachers and county agricultural extension agents.

Data were collected through use of a modified delphi technique. Each teacher and agent was first asked to identify the five major agricultural problems in the local community which, in his/her opinion, were most in need of research solutions. Responses were edited and combined into 136 ratable statements (problems) which formed a second survey form sent to and completed by the same population. Participants rated each statement as to its perceived importance in their own communities.

Of the 136 problems identified by respondents, 19 were considered very important in the state, overall. Three problems were considered particularly serious: Multiflora rose eradication; coping with high production costs and interest rates; and improving state level funding for extension and vocational agriculture programs. These three items, as well as farmland protection and preservation and increasing weaning weights of feeder calves, were serious problems common to all six regions of the state.

Major problems were identified in 11 categories: field crop production, horticulture, plant pests/diseases, pasture management, livestock production, marketing and processing, farm management, machinery and structures, soil and water conservation, energy and rural development, extension and education.

In general, vocational agriculture teachers and county agricultural extension agents agreed closely on importance of problems identified.

**Table 15.**
Specific problems in rural development, extension and education most in need of research solutions

| Problem and Rank | Position VAT n=79 | Position CEA n=37 | Regions 1 n=23 | Regions 2 n=22 | Regions 3 n=23 | Regions 4 n=18 | Regions 5 n=13 | Regions 6 n=17 | Overall Mean N=116 | SD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Improvement of state level funding for extension and vo-ag programs | 3.52 | 3.51 | 3.39 | 3.64 | 3.69 | 3.22 | 3.38 | 3.71 | 3.52 | 0.74 |
| 2. Protection of farmland from oil, gas and coal companies | 3.56 | 3.32 | 3.57 | 3.36 | 3.82 | 3.44 | 3.38 | 3.18 | 3.48 | 0.72 |
| 3. Farmland preservation and retention | 3.33 | 3.38 | 3.26 | 3.64 | 3.30 | 3.28 | 3.23 | 3.29 | 3.34 | 0.75 |
| 4. Effect of laws and regulations on the farm community | 3.24 | 3.30 | 3.22 | 3.41 | 3.26 | 3.11 | 3.23 | 3.29 | 3.26 | 0.72 |
| 5. Land owner rights in strip mine and oil fields reclamation | 3.30 | 3.16 | 3.43 | 2.77 | 3.61 | 3.39 | 3.31 | 3.00 | 3.26 | 0.96 |
| 6. Means of changing farmers' attitudes toward adoption of new ideas and practices | 2.99 | 3.03 | 3.00 | 3.18 | 2.96 | 2.72 | 3.08 | 3.06 | 3.00 | 0.83 |
| 7. Job satisfaction of vo-ag teachers | 3.43 | 2.05 | 3.13 | 2.82 | 3.17 | 2.89 | 2.77 | 3.06 | 2.99 | 1.18 |

**Table 15. (continued)**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8. Ways of getting farmers to organize to solve their own problems | 3.01 | 2.92 | 2.87 | 3.18 | 2.91 | 2.62 | 3.00 | 3.35 | 2.98 | 0.89 |
| 9. Effective use of media in imparting agricultural information | 3.04 | 2.86 | 3.00 | 3.00 | 2.96 | 2.83 | 3.00 | 3.12 | 2.98 | 0.75 |
| 10. Accountability of vo-ag programs | 3.25 | 2.35 | 3.00 | 2.95 | 3.17 | 2.67 | 2.92 | 3.00 | 2.96 | 1.11 |
| 11. Determining areas suitable for agricultural development | 2.87 | 2.62 | 2.87 | 2.91 | 3.09 | 2.55 | 2.54 | 2.59 | 2.79 | 0.91 |
| 12. Adapting vo-ag to decreasing funding levels | 3.20 | 1.92 | 3.09 | 2.68 | 3.13 | 2.16 | 2.69 | 2.82 | 2.79 | 1.21 |
| 13. Identification of rural development opportunities | 2.78 | 2.78 | 2.65 | 2.68 | 3.04 | 2.78 | 2.77 | 2.76 | 2.78 | 0.83 |
| 14. Impact of tourism on the local community | 2.30 | 2.43 | 2.22 | 2.73 | 3.00 | 2.75 | 1.92 | 2.59 | 2.34 | 0.97 |

Rating Scale: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important.

## Conclusions

From analysis of data obtained, the following conclusions were drawn:

1. Multiflora rose eradication, coping with high production costs and interest rates, and improving state level funding for extension and vocational agriculture programs are the most serious agricultural problems in need of research solutions. These, as well as farmland protection and preservation and increasing weaning weights of feeder calves, are major problems common to all regions of West Virginia.
2. Research in field crop production is important for the development of agriculture in West Virginia. Problems connected with economic sources of N, P and K, efficient methods of lime and fertilizer application for small farmers, alfalfa establishment, no-till corn production practices, and tobacco production and marketing all need research attention.
3. Although several problems affect the horticultural industry, potential for commercial vegetable production and processing is the most important.
4. Multiflora rose eradication and weed and brush control in pastures are the most outstanding problems in pest and disease management that need immediate research solutions. Other serious problems in this category are those relating to chemical weed control in crops and prevention and control of tobacco diseases.
5. Several problems in pasture management need research solutions. However, liming and fertilization methods, hay making with limited labor, and development of pasture legumes and grasses are considered to be the most serious in West Virginia. Problems associated with pasture renovation and forages for shale lands in the eastern part of the state also need research attention.
6. The livestock industry in West Virginia is facing many problems. The most outstanding are those connected with increasing weaning weights of feeder calves, control of face fly, pink eye and foot rot (particularly in sheep), and prevention of grass tetany.
7. Improved livestock marketing systems and the economic feasibility of direct marketing—i.e., from farmer to retailer or/and consumer—are important areas in agricultural marketing in need of study.
8. Coping with high production costs and interest rates and budgeting for machinery, buildings, equipment and livestock are the most important problems in farm management. Farm estate planning, means of getting

started in farming, reducing capital investment on the farm, and farm management for small-scale family or part-time farm operations are also serious problems in this category.

9. Agricultural safety is the most important area in farm machinery and structures in need of research. Other outstanding research areas include those connected with fences (building, repairing, maintenance), and development of energy efficient machinery.
10. Practical and inexpensive soil erosion control measures are seriously needed by farmers in West Virginia.
11. Problems in agricultural energy most in need of research solutions include those connected with energy conservation and development of alternative energy sources.
12. Improvement of state level funding for extension and vocational agriculture programs, protection and preservation of farmland, and effects of laws and regulations on the farm community are the major areas which need serious research attention in rural development and extension/education.

## Recommendations

This study was designed to identify specific problems in agriculture most in need of research solutions as perceived by West Virginia vocational agriculture teachers and county extension agents. Analysis of questionnaire responses reveals some suggestions for improvement/adjustments in the present research program at West Virginia University and other affiliated institutions. Based on the findings and conclusions emanating from this and other studies and a review of literature, the following recommendations are made:

1. The study identified several agricultural problems in need of research solutions, indicating that the research system has not adequately addressed itself to these problems. There is a need for a clear dynamic process for (1) evaluating existing research activities; (2) identifying potential research opportunities; and (3) developing mission-oriented research priorities. This may necessitate establishment of an Advisory Council with "outside groups" (particularly agricultural educators at the grass roots level and consumers of research results) having a voice in determining research priorities and emphasis.
2. Funding for publicly supported agricultural research has been one of the major limiting factors in expanding its scope. Such funding must be significantly expanded so that research and agriculture can effectively play an important role in expanding the economy of the state.

3. The agricultural community in West Virginia is composed of small (full-time or part-time), intermediate, and large-scale farmers, and agribusinessmen. Steps should be taken to ensure that research policy and programs adequately reflect the needs and concerns of all these groups and make effective use of available resources.
4. The Cooperative Extension Service is a major component of the agricultural research delivery system. It is the vehicle of a "broad spectrum" which carries the research findings to the clientele—the farmer and agribusinessman. Results of the study suggest that vocational agriculture teachers and county extension agents are somewhat unaware of available research information. Steps should be taken to ensure that research findings are communicated to educators and farmers as soon as they are obtained and ascertained. This necessitates close links and mutual understanding between research and extension/education and timely publication of research results.
5. The study has identified many problems which beset the agricultural industry in West Virginia and which need immediate research attention. It is important that those concerned with research become aware of problems identified in this study and take them into consideration when evaluating present programs or/and developing future research programs. Problems unique to various regions should be given due consideration.

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